Smartphone accelerometers distinguish between different motorized transportation modalities

13 November 2013

Identifying the individual's transportation behavior is a fundamental problem, as it reveals information about the user's physical activity, personal CO2 -footprint and preferred transit type. On a larger scale, this information could be aggregated to discover information about the utilization of different transportation options to aid urban planning.

Researchers from the University of Helsinki have developed methods for extracting information about vehicular movement patterns from measurements of a smartphone accelerometer. The key idea is to extract characteristic acceleration and breaking patterns and to use these as a kind of signature to separate between different vehicular transportation modes.

The main researcher, Samuli Hemminki, explains: "Extracting vehicular movement information from smartphone accelerometers is challenging as the placement of the device can vary, users interact with the phone spontaneously, and as the orientation of the phone can change dynamically. We overcame these challenges by developing novel algorithms for processing and analyzing accelerometer measurements."

Experimental evaluations demonstrate that the technique can detect most common public transportation types (bus, tram, metro, train, car, walking) with over 80 per cent accuracy. The benefits of the method are particularly pronounced in daily monitoring as the system has low power consumption and works robustly in continuous detection tasks.

Dr. Petteri Nurmi from University of Helsinki adds: "Our work enables fine-grained modeling of human transportation behavior and serves as an important building block for new kinds of mobile applications. For example, our methods would be beneficial to an application that provides feedback to encourage drivers towards more ecological driving style or to map deviations in public transportation."

Professor Sasu Tarkoma explains: "This research shows that it is possible to accurately detect the transportation mode on smartphones in an energy efficient manner. The system enables a whole new breed of mobility-aware applications and services."

More information: The research paper will be presented at the 11th ACM Conference on Embedded Networked Sensor Systems SenSys'13 in Rome, Italy on 11 November, 2013.

Provided by University of Helsinki